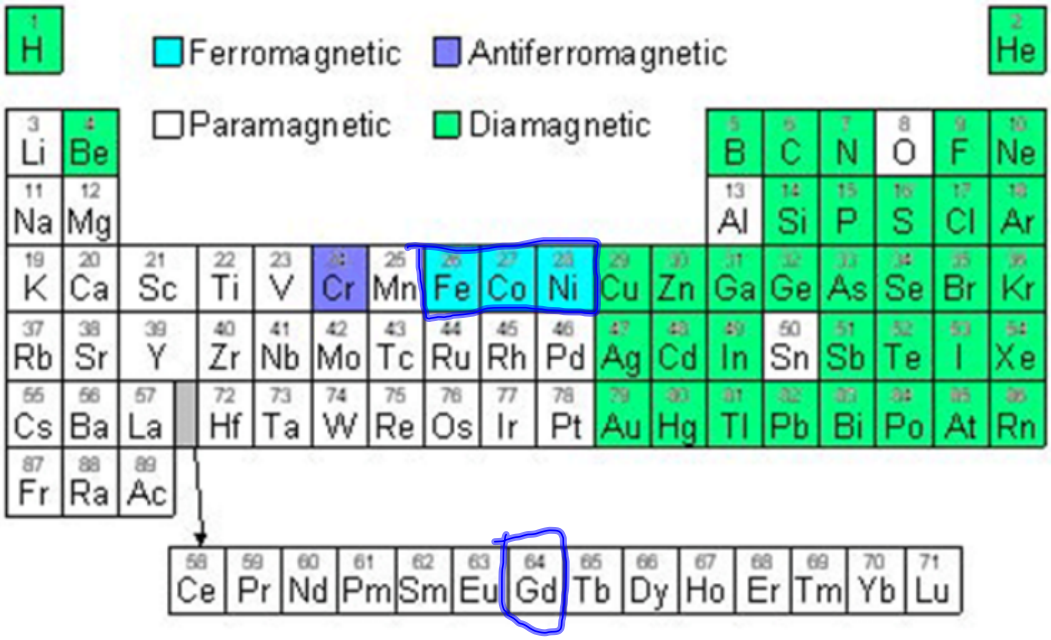
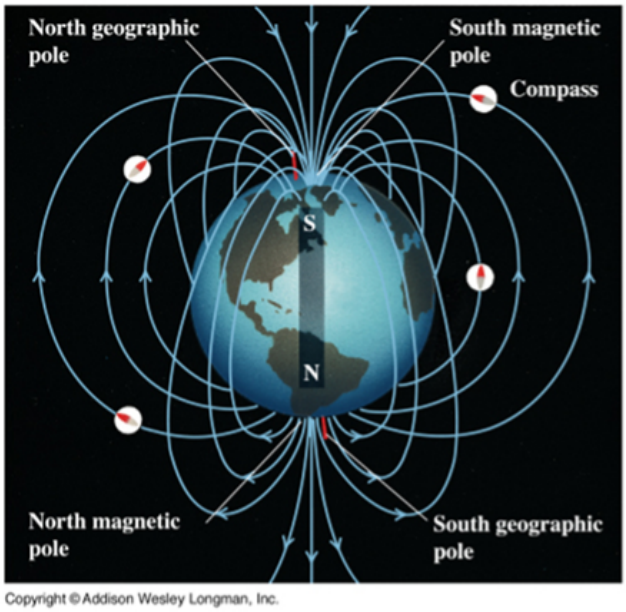
Magnetism and Electricity:

- Magnetism:
  - A magnet is an object that produces a magnetic field.
  - Magnets that are natural or man-made.



- Naturally Magnetic Elements:
  - Nickel
  - Iron
  - Cobalt
  - Gadolinium (Gd)



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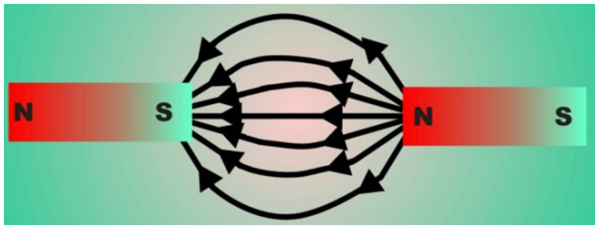
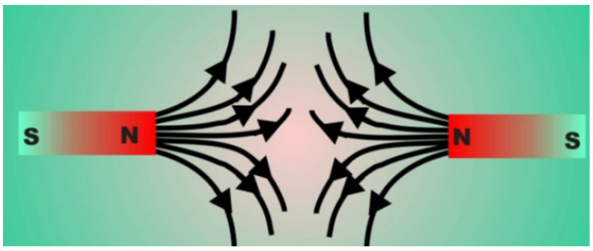
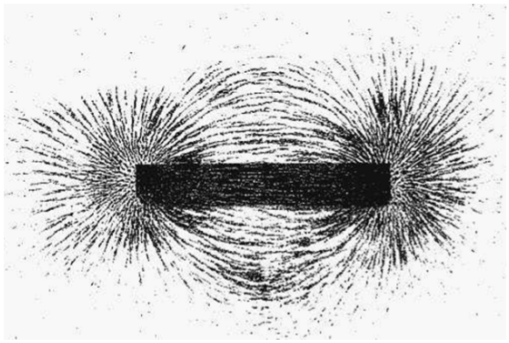
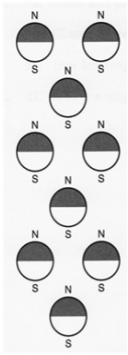
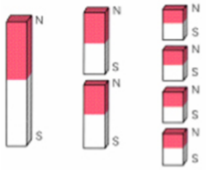








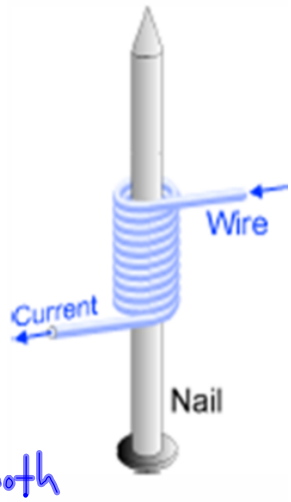
- When atoms are aligned, a strong magnetic field is formed.



- Magnets ALWAYS exist as dipoles (Always must have a north and south.)

- Magnetic Properties:
  - All magnets have 2 poles (dipole).
  - Monopoles do NOT exist in magnets (as of now...), but they do exist in electricity.
  - Like poles repel, opposite poles attract.
- Permanent Magnets:
  - Substances that are magnetic all the time.
  - Use permanent magnets to change other substances into magnets.
- Magnetic Fields:
  - Analagous to electric fields
  - Causes interactions between magnets
  - Arrows point from north to south
  - Lines closer together means a stronger field

- Electromagnets:
  - Use a wire to create a magnet → put loops in the wire



  - This works because a moving charge creates both an electric and magnetic field.
  - Strength of electromagnet depends on...
    - Wire size
    - Number of loops → increase to increase field strength
    - Amount of current → higher the current the higher the field strength
    - Insert an iron core